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INTERLOCKING SYSTEM FOR RAILROADS

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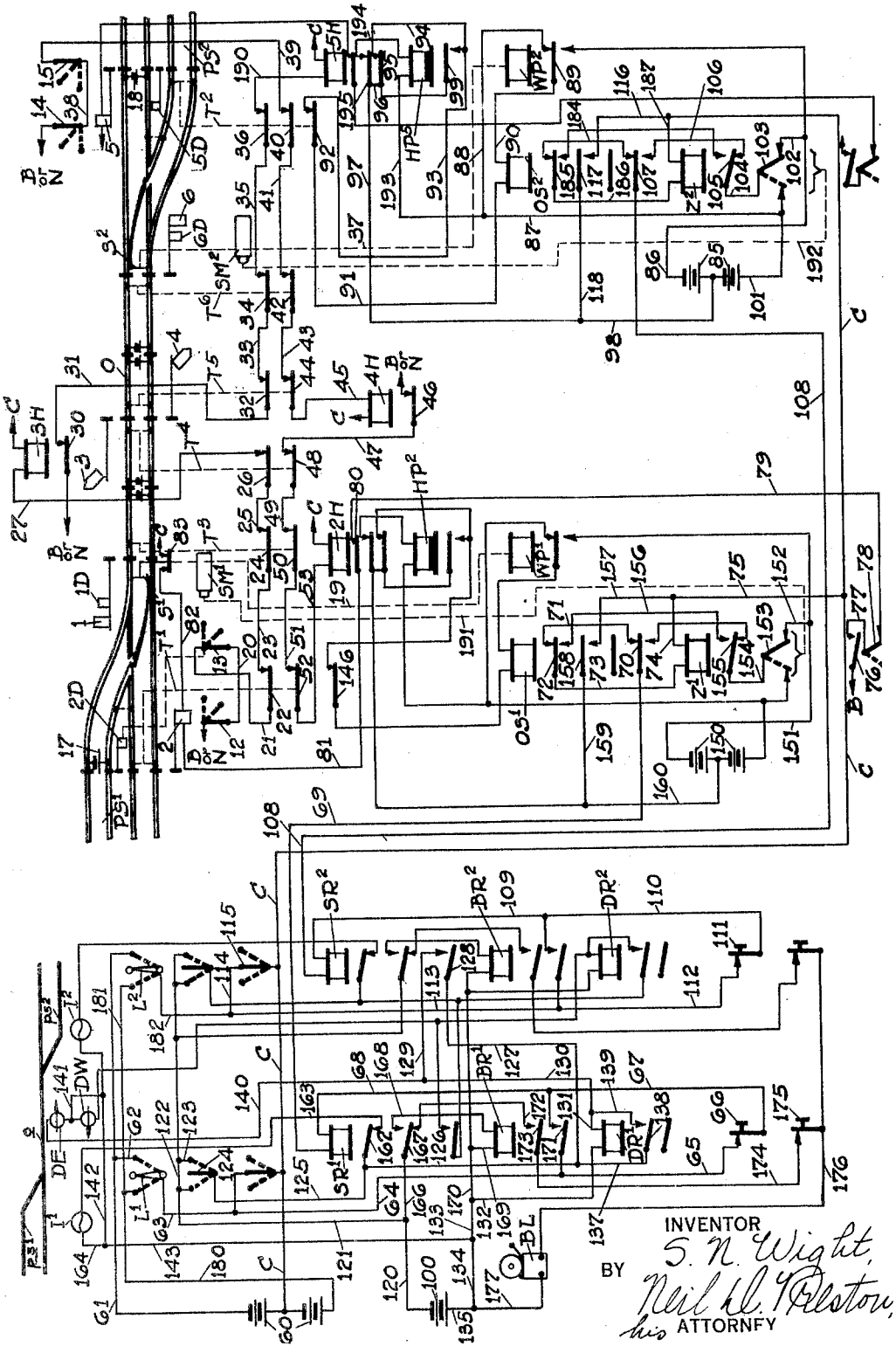

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INTERLOCKING SYSTEM FOR RAILROADS

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This invention relates to train dispatching systems of the type in which train movement is directed through the medium of wayside signal indications, and more particularly to a system of the type in which only a single line circuit connects the dispatcher's office with each of the various way stations.

In my prior Patent No. 1,913,496 dated May 14, 1929, I have disclosed a system wherein there is provided a lever in the dispatcher's office for each end of a single track section, said single track section being signaled for both directions of train movement by a signalling system of absolute-permissive-block type, and in which the direction of train travel over such absolute-permissive-block system is determined by the sequence in which the levers for clearing signals at the ends of such single track section are operated. In said system I have provided apparatus in the dispatcher's office which indicates the sequence in which such levers have been moved. It has been found in practice that if these two levers are moved too quickly in sequence it is possible that the direction of traffic set up on such single track section is contrary to the sequence in which the levers have been moved. Also, in said prior patent indicating lamps having an arrow marked thereon indicating in the dispatcher's office the sequence in which the levers have been moved are provided. It therefore, appears that if the dispatcher, contrary to his rules, moves the levers too quickly in succession, the direction of traffic actually set up may be contrary to the direction indicated by the directing arrow indicating lamps.

In view of all of the foregoing and other important considerations, it is proposed in accordance with the present invention to provide direction arrow indicating lamps in the dispatcher's office, which are not controlled directly by the sequence in which levers are moved, but are controlled in accordance with the direction of traffic which has been set up in the field in response to the falling of one of the tumble-down circuits for that particular single track section, so that the operator may operate one lever, may then wait for the direction arrow lamp for indicating the particular direction of traffic which has been set up to light after which the dispatcher may move his second lever, so that these direction arrow lights not only inform the operator what direction of traffic has been set up, but also tell him when he may move the second lever of the two levers which are to be moved in a certain sequence.

Other objects, purposes and characteristic features of the present invention will in part be obvious from the accompanying drawing and will in part be more specifically pointed out hereinafter.

In describing the invention in detail reference will be made to the accompanying drawing, in which the apparatus at the left hand end of the drawing conventionally illustrates the apparatus in the dispatcher's office, and the right hand portion of the drawing illustrates a single track section connecting two passing sidings and illustrates the control apparatus at each end of such single track section.

Structure

Referring to the drawing, especially the right hand portion thereof, has been illustrated a railway system together with the way station apparatus of two way stations of a dispatching system embodying the present invention. Although in practice the railway system includes many passing sidings, diverging routes, draw bridges and the like, for the purpose of illustrating the invention, the system has been confined to the single track section O connecting the ends of the adjacent passing sidings PS^1 and PS^2. These passing sidings PS^1 and PS^2 have their side tracks connected to the single track section O through the medium of track switches S^1 and S^2. The east end of the passing siding PS^1 is provided with the usual starting signal 2 for the main track, and the usual dwarf starting signal 2D for the side track, and likewise the main entering signals at this end of the passing siding PS^1 have been designated 1 and the take-siding signal has been designated 1D. Similarly, the west end of the passing siding PS^2 is provided with a main

starting signal 5 and a dwarf starting signal 5D, and has been provided with an entering signal 6 and a take-siding signal 6D. These signals form part of an absolute-permissive-block signalling system associated with the railway system, this absolute-permissive-block signalling system also includes the intermediate signals 3 and 4 for governing west bound and east bound traffic, respectively, through the single track section O. Each of these signals has associated with it a home relay, of which the home relays 2H, 3H, 4H and 5H only have been illustrated, these home relays, respectively, controlling the signals 2, 3, 4 and 5.

The starting signals 2, 2D, 5 and 5D have associated therewith contacts 12, 13, 14 and 15, respectively, each contact of which is only closed when the signal with which it is associated is at stop. The track switches S^1 and S^2 have associated therewith the usual detector track circuits including, respectively, the relays T^1 and T^2. These detector track circuits include track batteries 17 and 18, respectively. Similarly, each of the blocks of the single track section O contains divided track circuits which include track relays T^3, T^4, T^5 and T^6, and each of these track circuits also includes a track battery.

The home relay 3H is normally energized through the following circuit: beginning at the positive B or negative terminal N (depending on traffic conditions to the left of signal 1) of a suitable battery, contact 12 of the signal 2, wire 20, contact 13 of the signal 2D, wire 21, contact 22 of the track relay T^1, wire 23, contact 24 of the track relay T^3, wire 25, contact 26, of the relay T^4, wire 27, winding of the relay 3H, to the other terminal C of said battery.

The relay 5H is normally energized through the following circuit: beginning at the terminal B or N, depending upon traffic conditions in advance of the signal 3, front contact 30 of the home relay 3H, wire 31, front contact 32 of the track relay T^5, wire 33, front contact 34 of the track relay T^6, wire 35, front contact 36 of the track relay T^2, wire 190, winding of the relay 5H, to the other terminal C of said battery.

Similarly, the home relay 4H is normally energized through the following circuit: beginning at the terminal B or N (depending on traffic conditions toward the right of the signal 6), contact 14 of the signal 5, wire 38, contact 15 of the signal 5D, wire 39, front contact 40, the track relay T^2, wire 41, front contact 42 of the track relay T^6, wire 43, front contact 44 of the track relay T^5, wire 45, winding of the relay 4H, to the other terminal C of said battery.

Also, the relay 2H, normally energized through the following circuit: beginning at the terminal B or N of a suitable battery, front contact 46 of the relay 4H, wire 47, front contact 48 of the relay T^4, wire 49, front contact 50 of the relay T^3, wire 51, front contact 52 of the relay T^1, wire 53, winding of the relay 2H to the other terminal C of said battery.

Each of the circuits just traced through the relays 2H, 3H, 4H and 5H comprise part of the tumble-down circuits of the single track section O. These are known as "tumble-down circuits" because the energization of the relay 5H, for instance, is dependent upon the energized condition of the home relay 3H; and similarly, the energization of the home relay 2H is dependent upon the home relay 4H being in its energized position. In other words, if the signals 2 or 2D, for instance, is moved from its stop position the home relay 5H is eventually de-energized; and similarly, if the starting signal 5 or 5D, for instance, is allowed to clear the home relay 2H is eventually de-energized. This de-energization of the home relays 5H or 2H is said to be due to the falling of the tumble-down circuit. These features are more specifically described in my prior application, Ser. No. 48,553, to which reference may be had if desired.

The home relay 2H has associated therewith a repeater home relay HP^2, which repeater relay repeats the condition of the home relay 2H after a time delay because the repeater relay HP^2 is slow dropping. Similarly, the home relay 5H is provided with a slow acting repeater relay HP^5. The switch S^1 has associated therewith a switch repeater relay WP^1, which relay is controlled through a suitable circuit conventionally shown by the dotted line 19, and assumes its de-energized position when the switch S^1 is in an intermediate position, and is energized so long as the switch S^1 assumes either of its extreme positions. Similarly the switch S^2 is provided with a switch repeater relay WP^2, which is controlled in like manner as the relay WP^1 through the medium of circuit 37. The way station apparatus at the west end of the single track section O also includes a relay OS^1 and a control relay Z^1; whereas the way station apparatus at the east end of the signal track section O is provided with a relay OS^2 and a control relay Z^2.

Referring now to the dispatcher's office apparatus, which is shown in the left hand portion of the drawing, this apparatus preferably includes a miniature track layout corresponding in general to the actual lay-out on the railway system to which the present invention is applied. In the particular arrangement shown, this miniature track lay-out includes only a portion of the miniature passing siding ps^1, the single track section o, and a portion of the passing siding ps^2. The single track section shown in miniature and designated o has associated therewith direction indicating lamps DE and DW, which when energized, respectively indicate that

east bound and west bound direction of train movement has been set up in the single track section O.

Also, the miniature passing siding ps^1 has associated therewith an indicating lamp I^1, whereas the miniature passing siding ps^2 has associated therewith an indicating lamp I^2. In the dispatcher's office, and preferably directly below the miniature track lay-out, is provided a suitable lever machine for controlling the distant track switches and signals, and the lever L^1, which controls the track switch and signal at the west end of the single track section O is associated with the indicating lamp I^1 at the west end of the single track section *o*; whereas the lever L^2 which controls the signal 6 and may control the switch machine SM^2 is associated with the east end of the miniature track lay-out of the single track section *o*. Further, there are associated with the lever L^1 the relays SR^1, BR^1 and DR^1; and there are associated with the lever L^2 the relays SR^2, BR^2 and DR^2. There is also provided a bell BL, the purpose of which will be pointed out in the operation of the system. Having now pointed out the various elements of the system, it is believed expedient to point out how these elements cooperate, which is most readily done by explaining the operation of the system.

Operation

Let us assume that there is a train moving from left to right on the main track of the passing siding PS^1, and that the dispatcher wishes this train to proceed its movement through the single track section O and into the side track of the passing siding PS^2. In order to accomplish this the operator must not only operate his levers L^1 and L^2 in the sequence given, but he must operate them sequentially with an intervening period of delay sufficient to allow the tumble down circuits associated with the single track section O to fall, and further he must move his lever L^1 to the right, thereby allowing the switch machine SM^1 (which may be controlled through the medium of suitable circuits such as shown in my prior application Ser. No. 120,423 filed July 3, 1926, and conventionally shown by dotted line 191) to remain in its main track position, and he must move the lever L^2 to the left to effect operation of the switch machine SM^2 to the take siding position, through similar circuits conventionally shown at 192. The manner in which this control of the switch machine is accomplished is also described in detail in my prior application Ser. No. 48,553, to which reference has already been made.

In order to carry out this train movement the dispatcher will move his lever L^1 toward the right, thereby completing the following circuit for the control relay Z^1, which circuit includes the series relay SR^1: beginning at the positive terminal of the battery 60, wires 61 and 62, lever contact L^1, wires 63, 64 and 65, hand switch 66, wires 67 and 68, winding of the series relay SR^1, line wire 69, front contact 70 of the relay OS^1, wire 71, front contact 72 of the relay OS^1, wire 73, winding of the control relay Z^1, wire 74, 75 and C, to the mid-point of the battery 60. The closure of the circuit just traced causes the relay Z^1 and the series relay SR^1 to assume their energized position, and since the current flow is of positive polarity the control relay Z^1 will be energized toward the right.

With the control relay Z^1 energized to the right the switch machine SM^1 would be operated to its main track position if it not already assumed that position, and with this relay Z^1 energized toward the right the starting signal 2 is operated to its clear position through the following circuit: beginning at the terminal B, front contact 76 of the relay Z^1, wire 77, polar contact 78 of the relay Z^1, wire 79, front contact 80 of the home relay 2H, wire 81, signal 2, wire 82, switch box contact 83 closed only when the switch S^1 is in its main track position, to the other terminal C of said battery. Although in practice the various starting and entering signals are preferably three position signals as illustrated in my prior applications, the caution circuit for these signals has for convenience been omitted, the clear circuit only having been illustrated. The circuit just traced permits the signal 2 to move to its clear position, assuming traffic conditions in advance thereof to be favorable, thereby causing the signal contact 12 to open, thus resulting in the de-energization of the home relay 3H.

With the home relay 3H de-energized, the energizing circuit for the home relay 5H is broken. The energizing circuit for the relay HP^5 may be traced as follows: beginning at the negative terminal of battery 85 wire 101, 87 and 193, winding of relay HP^5, wire 194, front contact 195 of relay 5H, wires 97 and 98, back to battery 85. With the home relay 5H de-energized the energizing circuit for the repeater home relay HP^5 is broken, so that this relay HP^5 will after a time assume its de-energized position, and in the meantime (time between dropping of relays 5H and HP^5) the circuit for the relay OS^2 is open. This circuit for the relay OS^2 may be traced as follows: beginning at the negative terminal of battery 85, wires 101, 87 and 88, front contact 89 of the relay WP^2, wire 90, winding of the relay OS^2, wire 91, front contact 92 of the track relay T^2, wires 93 and 94, front contact 95 of the relay 5H, wires 96, 97 and 98, back to the mid-point of the battery 85. The circuit just traced will be opened at the contact 95 of the relay 5H, and after a short period of delay will again be closed at the front contact 99 of the repeater home relay

HP^5, so that the relay OS^2 is only momentarily de-energized.

This momentary de-energization of the relay OS^2 causes momentary application of current to the series relay SR^2 through the following circuit: beginning at the positive terminal of the battery 85, wires 86 and 102, polar contact 103 of the relay Z^2, wire 104, back contact 105 of the relay Z^2, wire 106, back contact 107 of the relay OS^2, line wire 108, winding of the series relay SR^2, wires 109 and 110, hand switch 111, wires 112, 113 and 114, contact 115 of the lever L^2 assuming its middle position, through common return wire C, wire 116, back contact 117 of the relay OS^2, wires 118 and 98 to the mid-point of the battery 85.

The momentary completion of this circuit effects momentary energization of the series relay SR^2 and effects momentary closure of the following pick-up circuit for the direction relay DR^1: beginning at the positive terminal of the battery 100, wires 120, 121, 122 and 123, contact 124 of the lever L^1 assuming its right hand position, wires 125, 126 and 127, front contact 128 of the series relay SR^2, wires 129, 130 and 131, winding of the direction relay DR^1, wires 132, 133, 134 and 135, back to the battery 100.

The closure of the circuit just traced effects momentary energization of the direction relay DR^1, with this direction relay DR^1 energized it will remain energized by the current flowing in the following stick circuit: beginning at the positive terminal of the battery 100, wires 120, 121, 122 and 123, contact 124 of the lever L^1, wires 125, 126 and 137, stick contact 138 of the relay DR^1, wires 139 and 131, winding of the relay DR^1, wires 132, 133, 134 and 135, to the negative terminal of the battery 100. Obviously, this delay DR^1 will remain energized so long as the lever L^1 remains in its right hand extreme position.

With this relay DR^1 energized the following circuit for energizing the east bound directions arrow light DE is closed: beginning at the positive terminal of the battery 100, wires 120, 121, 122 and 123, lever contact 124, wires 125, 126 and 137, front contact 138 of the relay DR^1, wires 139, 130 and 140, direction indicating lamp DE, wires 141, 142, 143, 134 and 135 back to the battery 100.

When the operator observes the illumination of the east bound direction arrow lamp DE, thus informing him that the tumble down circuit has fallen and the proper direction of traffic has been definitely set up, he will move his lever L^2 to the left, thereby effecting energization of the relay Z^2 to the left, through the following circuit: beginning at the negative terminal of the battery 60, wires 180 and 181, lever L^2 toward the left wires 182, 113, 112, switch 111, wires 110 and 109, winding of the relay SR^2, line wire 108, front contact 107 of relay OS^2, wire 184, contact 185, of the same relay, wire 186, winding of the relay Z^2, wires 187 and C, to the mid-point of battery 60. This energization of the relay Z^2 toward the left will result in operation of the switch machine SM^2 to the take-siding position, and will result in the clearing of the take-siding signal 6*d*, this because the home relay 5H has been de-energized for reasons heretofore given and with the home relay 5H de-energized, the control relay Z^2 energized, and the switch S^2 assuming the take-siding position, the take-siding signal 6^D will be energized all in a manner as clearly described in my prior application, Ser. No. 48,553, above referred to.

It is thus seen that the direction of traffic set up is determined by the sequence in which the levers L^1 and L^2 are moved, and that the dispatcher is informed by the illumination of a direction arrow indicating lamp when he has allowed sufficient time to elapse after moving the first lever to allow the tumble down circuit to fall and permit him to move the second lever.

It is of course understood that the starting signals at opposite ends of section O are interlocked and that if both levers L^1 and L^2 are moved to an extreme position simultaneously it is uncertain as to which signal clears first and prevents the other signal from clearing.

Let us now observe how the dispatcher is informed of the movement of the train in question out of the main track of the passing siding PS^1 into the single track section O. Movement of the train past the signal 2, which now assumes its proceed position, the treading of this train upon the detector track circuit, associated with the switch S^1, effects de-energization of the track relay T^1, thereby effecting opening of the contact 146 of this track relay T^1. The opening of this contact 146 effects de-energization of the relay OS^1 (this circuit having been traced in connection with the relay OS^1), and dropping of the relay OS^1 causes the control relay Z^1 to be maintained energized through the following stick circuit: beginning at the positive terminal of the battery 150, wires 151 and 152, polar contact 153 of the relay Z^1, wire 154, neutral contact 155 of the relay Z^1 in its energized position, wire 156, back contact 72 of the relay OS^1, wire 73, winding of the relay Z^1, wires 74 and 157, back contact 158 of the relay OS^1, wires 159 and 160, to the mid-point of the battery 150.

Also, with the relay OS^1 de-energized and the control relay Z^1 energized the original circuit for the control relay Z^1 is broken at the front contact 70 of the relay OS^1, so that the series relay SR^1 in the dispatcher's office is de-energized, and will effect illumination of the track occupancy indicating lamp I^1, through closure of the following circuit:

beginning at the positive terminal of the battery 100, wires 120, 121, 122 and 123, contact 124 of the lever L^1, wire 125, back contact 162 of the relay SR^1, wire 163, indicating lamp I^1, wires 164, 143, 134 and 135, to the negative terminal of the battery 100. Illumination of the indicating lamp I^1 will inform the dispatcher that the train in question has tread upon the detector track circuit containing the track relay T^1. Further, dropping of the series indicating relay SR^1 will effect de-energization of bell relay BR^1, this bell relay BR^1 having been energized through the following circuit: beginning at the battery 100, wires 120 and 166, front contact 167 of the relay SR^1, wire 168, winding of the relay BR^1, wires 169, 170, 133, 134 and 135. With this circuit broken the relay BR^1 will of course be de-energized, but by reason of the fact that this relay BR^1 is somewhat slow acting the following circuit for sounding the bell BL is momentarily closed: beginning at the battery 100, wires 120 and 166, back contact 167 of the relay SR^1, wire 172, front contact 173 of the relay BR^1, wire 174, hand switch 175, wire 176, winding of the bell BL, wires 177 and 135, to the negative terminal of the battery 100.

This momentary closure of the circuit for the bell BL will audibly inform the dispatcher of a change in traffic conditions in the field, so that he may look at his indicating lamps and observe what change in traffic conditions has taken place. In this connection it may be pointed out that the hand switch 175 may be opened and left opened, in which event the bell BL will not be sounded for that particular function, similar hand switches being provided for other bell circuits which are momentarily closed in response to illumination of other indicating lamps, such as indicating lamp I^2.

Also, if desired, the hand switch 66 may be left open, in which event the circuit for the corresponding control relay, namely, the control relay Z^1, will be opened in response to momentary de-energization of such circuit, as by the passage of a train, or the like. In other words, if the switch 66 is opened after the lever L^1 has been moved to an extreme position the relays SR^1 and Z^1 are included in a stick circuit including the stick contact 171, which stick circuit is permanently broken upon momentary breaking thereof. This feature prevents a second train of two following trains from accepting the signal 1, in that the signal 1 cannot again clear automatically after the passage of such first train when the hand switch 66 is open.

Let us now assume that the train in question proceeds in an easterly direction and enters the detector track circuit containing the track relay T^2, this of course occurring after the control relay Z^2 has been energized. In this event, the indicating lamp I^2 in the dispatcher's office is illuminated in exactly the same way as the indicating lamp I^1 is illuminated in response to the de-energization of the track relay T^1.

In accordance with the embodiment of the invention illustrated, it is of course understood that the switch machines SM^1 and SM^2 are controlled through circuits 191 and 192 in accordance with the polar positions of the control relays Z^1 and Z^2, respectively, and that the main starting and entering signals can be cleared only after the corresponding track switch assumes the main track position, and in that event they will be controlled in accordance with the sequence in which adjacent levers governing signals at opposite ends of a single track section are moved, and that the dwarf starting signal for the take-siding signal can only be cleared in the event the associated track switch assumes the take-siding position, all as explained in my prior application, Ser. No. 48,553, above referred to. It is further desired to be understood that the switch machines may, of course, be omitted, in which case the engineer or fireman of the approaching train will operate the track switch to a position which will clear one or the other of the entering signals upon entering a passing siding or one or the other of the starting signals as a train is to leave the passing siding, all as explained in said prior application.

Having thus shown and described one rather specific embodiment of an invention in which the direction of traffic in a dispatching system including a comparatively few line wires may be set up in accordance with the sequence in which levers are moved, and in which provision is made for indicating to the dispatcher the necessary intervening period of time required in order to set up such direction of traffic by the sequence of lever movement, and informing him when to move the second of two levers in response to such indication, it is desired to be understood that the particular embodiment of the invention illustrated has been selected for the purpose of disclosing the underlying principles of the invention rather than the scope of the invention, or the exact construction preferably employed in practicing the same; and that various changes, modifications and additions may be made to adapt the invention to the particular track lay-out and signalling system to which the invention is to be applied, all without departing from the spirit or scope of the invention, or the idea of means underlying the same, except as demanded by the scope of the following claims.

What I claim as new is:

1. In a train dispatching system, the combination with a single track section signalled for both directions of travel through the medium of absolute-permissive-block signaling and including two tumble-down circuits

one for each direction of travel, a starting signal at each end of said signal track section interlocked through the medium of said tumble-down circuits so that only one of said starting signals can clear at one time, a line circuit for each of said signals, means for controlling a particular one of said signals over its associated line circuit, and means effective only if no attempt is made to clear the other signal for indicating the condition of energization of one of said tumble-down circuits over said associated line circuit.

2. In a train dispatching system, the combination with a single track section signalled for both directions of travel through the medium of absolute-permissive-block signalling and including two tumble-down circuits one for each direction of travel; a starting signal at each end of said single track section interlocked through the medium of said tumble-down circuits so that only one of said starting signals can clear at one time, a line circuit for each of said signals; and means for controlling a particular signal over its associated line circuit by energizing said line circuit from one end, indicating traffic conditions at said particular signal by opening said line circuit near said signal and indicating the condition of energization of a tumble-down circuit by energizing said line circuit from the other end.

3. In a train dispatching system for single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble-down circuit for each direction of travel; a starting signal at each end of said single track section; a control relay at each end of said single track section for controlling the starting signal located at that end; a dispatcher's office; a line circuit for each control relay leading to said dispatcher's office; an indicating relay included in series with each of said line circuits; and means for energizing a particular line circuit from said dispatcher's office to clear the associated signal, open said circuit near said control relay to indicate traffic conditions at such associated signal and energize said particular circuit at the control relay end thereof to indicate that one of said tumble-down circuits has been deenergized.

4. In a train dispatching system for single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble-down circuit for each direction of travel; a starting signal at each end of said single track section; a control relay at each end of said single track section for controlling the starting signal located at that end; a dispatcher's office; a line circuit for each control relay leading to said dispatcher's office; an indicating relay included in series with each of said line circuits and located at said dispatcher's office; a track circuit adjacent each of said signals; and means for energizing a particular line circuit to effect picking up of the control relay and indicating relay included in said particular line circuit, for opening said line circuit in response to occupancy of said track circuit to effect deenergization of the indicating relay of said particular line circuit, and for energizing a source of current located at the control relay end of said particular line circuit in response to deenergization of one of said tumble-down circuits.

5. In a train dispatching system for single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble-down circuit for each direction of travel; a starting signal at each end of said single track section; a control relay at each end of said single track section for controlling the starting signal located at that end; a dispatcher's office; a line circuit for each control relay leading to said dispatcher's office; an indicating relay including in series with each of said line circuits and located at said dispatcher's office; a track circuit adjacent each of said signals; means for energizing a particular line circuit to effect picking up of the control relay and indicating relay included in said particular line circuit to control the associated signal, for opening said line circuit in response to occupancy of said track circuit to effect deenergization of the indicating relay of said particular line circuit, and for energizing such indicating relay by a source of current located at the control relay end of said particular line circuit in response to deenergization of one of said tumble-down circuits, and visual indicating means in said dispatcher's office controlled by the indicating relay of said particular line circuit.

6. In a train dispatching system for single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble-down circuit for each direction of travel; a starting signal at each end of said single track section; a control relay at each end of said single track section for controlling the starting signal located at that end; a dispatcher's office; a line circuit for each control relay leading to said dispatcher's office; an indicating relay included in series with each of said line circuits; a track circuit adjacent each of said signals; means for energizing a particular line circuit to effect picking up of the control relay and indicating relay included in said

particular line circuit, for opening said line circuit in response to occupancy of said track circuit to effect deenergization of the indicating relay of said particular line circuit, and for energizing such indicating relay by a source of current located at the control relay end of said particular line circuit in response to deenergization of one of said tumble-down circuits, visual indicating means in said dispatcher's office controlled by the indicating relay of said particular line circuit, and an audible signal sounded momentarily upon a change in the indication of said visual signal.

7. In a train dispatching system for single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble-down circuit for each direction of travel; a starting signal at each end of said single track section having a contact included in the tumble-down circuit for governing the reverse direction of traffic; a control relay at each end of said single track section for controlling the starting signal located at that end; a dispatcher's office; a line circuit for each control relay leading to said dispatcher's office; an indicating relay included in series with each of said line circuits; a track circuit adjacent each of said signals; a lever for each of said line circuits; a direction indicating stick relay for one of said line circuits; a pick-up circuit for said direction indicating stick relay including a front contact of the next adjacent indicating relay and a contact of the lever of said one line circuit closed when said lever assumes an extreme position; a stick circuit for said direction stick relay including said lever contact; another contact on said lever closed when said lever assumes said extreme position for energizing its associated control relay to effect clearing of its associated starting signal and effect tumbling down of the opposed tumble-down circuit; and means associated with the line circuit containing the next adjacent indicating relay for effecting momentary energization of said next adjacent indicating relay in response to the falling of said opposed tumble-down circuit; whereby the effective clearing of a signal by a line circuit is indicated over the next adjacent line circuit.

8. In a train dispatching system for single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble-down circuit for each direction of travel; a starting signal at each end of said single track section having a contact included in the tumble-down circuit for governing the reverse direction of traffic; a control relay at each end of said single track section for controlling the starting signal located at that end; a dispatcher's office; a line circuit for each control relay leading to said dispatcher's office; an indicating relay included in series with each of said line circuits; a track circuit adjacent each of said signals; a lever for each of said line circuits; a direction indicating stick relay for one of said line circuits; a pick-up circuit for said direction indicating stick relay including a front contact of the next adjacent indicating relay and a contact of the lever of said one line circuit closed when said lever assumes an extreme position; a stick circuit for said direction stick relay including said lever contact; another contact on said lever closed when said lever assumes said extreme position for energizing its associated control relay to effect clearing of its associated starting signal and effect tumbling down of the opposed tumble-down circuit; and means associated with the line circuit containing the next adjacent indicating relay for effecting momentary energization of said next adjacent indicating relay in response to the falling of said opposed tumble-down circuit; whereby the falling of the tumble-down circuit for one direction of traffic due to the clearing of a starting signal for the reverse direction of traffic, which starting signal is cleared through one line circuit, is indicated over another line circuit.

9. In a train dispatching system for the single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble down circuit for each direction of travel; a starting signal at each end of said single track section having a contact included in the tumble-down circuit for governing the reverse direction of traffic; a control relay at each end of said single track section for controlling the starting signal located at that end; a dispatcher's office; a line circuit for each control relay leading to said dispatcher's office; an indicating relay included in series with each of said line circuits; a track circuit adjacent each of said signals; a lever for each of said line circuits; a direction indicating stick relay for one of said line circuits; a pick-up circuit for said direction indicating stick relay including a front contact of the next adjacent indicating relay and a contact of the lever of said one line circuit closed when said lever assumes an extreme position; a stick circuit for said direction stick relay including said lever contact; another contact on said lever closed when said lever assumes said extreme position for energizing its associated control relay to effect clearing of its associated starting signal and effect tumbling down of the opposed tumble-down circuit; and means associated with the line circuit

containing the next adjacent indicating relay for effecting momentary energization of said next adjacent relay in response to the falling of said opposed tumble-down circuit; means governed by traffic conditions for opening the line circuit including the lever assuming its extreme position to effect de-energization of the indicating relay included in such line circuit; whereby the indicating relay in one line circuit by its energization indicates falling of a tumble-down circuit and the de-energization of the indicating relay in the other line circuit indicates traffic conditions.

10. In a train dispatching system for single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble-down circuit for each direction of travel; a starting signal at each end of said single track section having a contact closed when such signal is at stop included in the tumble-down circuit for governing the reverse direction of traffic, whereby the clearing of a starting signal for one direction of travel causes falling of the tumble-down circuit for the opposite direction of traffic; a control relay for each of said starting signals each controlled through a line circuit leading to a dispatcher's office; an indication relay included in series in each of said line circuits at said dispatcher's office; a lever in said dispatcher's office for each line circuit for including or excluding a source of current in such circuit to control the corresponding control relay and in turn the corresponding starting signal; and means governed by traffic conditions adjacent a starting signal for opening the line circuit controlling said signal to effect de-energization of the indicating relay included in said line circuit when said control relay is energized and for applying energy through said line circuit to effect energization of said indicating relay when the opposing tumble-down circuit has fallen.

11. In a railway signalling system, the combination with a single track section, a signal at one end of said section for governing the movement of trains into said section, a signal at the other end of said section for governing the movement of trains into said other end, a control circuit for each of said signals, and means for indicating over the circuit for controlling one signal when the other signal has been cleared effective only if said one signal has not been attempted to be cleared also.

12. In a railway signalling system, the combination with a single track section, a signal at one end of said section for governing the movement of trains into said section, a signal at the other end of said section for governing the movement of trains into said other end, a control circuit for each of said signals, means for indicating over the circuit for controlling one signal when the other signal has been cleared effective only if said one signal has not been attempted to be cleared also, and means for visually indicating over the circuit for controlling one signal when a train passes said one signal.

13. In a train dispatching system for single track railroads; the combination with a single track section having signals for governing both directions of train travel controlled by circuits of the absolute-permissive-block type and including a tumble-down circuit for each direction of travel; a starting signal at each end of said single track section having a contact closed when such signal is at stop included in the tumble-down circuit for governing the reverse direction of traffic, whereby the clearing of a starting signal for one direction of travel causes falling of the tumble-down circuit for the opposite direction of traffic; a control relay for each of said starting signals each controlled through a line circuit leading to a dispatcher's office; an indication relay included in series in each of said line circuits at said dispatcher's office; a lever in said dispatcher's office for each line circuit for including or excluding a source of current in such circuit to control the corresponding control relay and in turn the corresponding starting signal; and means for applying energy from the single track section end through said line circuit to effect energization of said indicating relay when the opposing tumble-down circuit has fallen.

In testimony whereof I affix my signature.

SEDGWICK N. WIGHT.